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4 CONSTRUCTION DESCRIPTIONS

4.1 General

4.1.1 As explained in **Section 1**, the HKLR and the HKBCF are closely inter-related. Hence the construction descriptions of both projects are presented in each's EIA Report.

4.1.2 The HZMB is targeted to be commissioned by 2015. To meet this target:

- (a) Construction of the HKLR will start in 2011, for completion in 2015, with a construction period of 4 years; *(At this stage, there is still some flexibility on the exact timing within 2011 for starting the construction of HKLR. However, it is patently desirable to start construction earlier, say in Early 2011, so as to alleviate the acuteness of criticality of construction works.)*
- (b) Construction of the HKBCF will start in the 3rd quarter of 2010, for first phase completion by End 2015, and second (final) phase completion by End 2016. *[The construction of HKBCF will involve reclamation, including lengthy surcharge-periods, followed by land-works including buildings and infrastructures etc. It is anticipated that the overall construction period for HKBCF will be at least 6 years. Even if construction (reclamation work) can start as early as 2010 3rd quarter, overall completion of HKBCF cannot be achieved by 2015. The reclamation and the landworks for HKBCF will therefore need to be completed in phases, such that at least a part ie. the first-phase of HKBCF (the extent of which and the facilities within which are adequate to handle the initial stage of the commissioned HZMB) will be completed by End 2015.]*

4.1.3 The attached **Figure 4.1** shows the phasing extent of HKBCF, as well as the interim layout for the first phase and the overall layout for the second phase (ie. the final phase).

4.1.4 In terms of construction activities, main Works elements for HKLR and HKBCF will broadly include:

- (a) For HKLR:
 - Approx. 9.4 km viaduct (ie. elevated bridgework, including substructures/foundations and superstructures) from HKSAR boundary to Scenic Hill on the Airport Island, which is mostly over waters and which constitutes a major proportion of the Works of HKLR;
 - Approx. 1.1 km tunnel through Scenic Hill and underpassing the Airport Road and the Airport Railway, daylighting in the reclamation noted below;
 - Reclamation adjacent to the eastern side of the Airport Island, together with a section of At-grade road leading to the HKBCF.
- (b) For HKBCF:
 - Reclamation Works, including mainly dredging, consolidation-measures, seawalls, reclamation-filling; *(The consolidation-measures are to accelerate consolidation of those marine sediments that are not dredged. These measures will mainly include laying of geotextile & sandblanket onto the seabed, together with installation of band-drains and surcharging.)*

- Land Works on the reclamation for serving the HKBCF, including mainly the Passenger Clearance Building and other buildings for BCF functions, various facilities for processing of coaches/cars/good vehicles, other infrastructures such as roadwork & services/utilities, associated works including landscaping;
 - Works on the Airport Island for connections with the HKBCF, including roadlinks and an Automated People Mover (APM) system.
- 4.1.5 Key construction features related to HKLR and HKBCF as outlined above are shown on **Figures 4.2 and 4.3**. These are described further in the following paragraphs.

4.2 HKLR Viaduct (from HKSAR Boundary to Airport Island)

4.2.1 Substructures

4.2.1.1 The substructures of the HKLR Viaduct will take the form of reinforced concrete (r.c.) columns & pilecaps founded on r.c. bored-piles. As stated above, the majority of the substructures will need to be constructed in waters.

4.2.1.2 **Figure 4.4** shows a typical arrangement for construction of the pilecaps and piles; including water-quality protection measures notably the use of casings etc. to contain any pollutants arisen from these construction works.

4.2.1.3 The aforesaid water quality protection measures were in fact adopted during construction of the marine bridge for Shenzhen Western Corridor SWC (now renamed as Shenzhen Bay Bridge). Water quality monitoring results at construction stage in that project revealed that, with these measures, there was no significant spillage/leakage of any pollutants arisen from the construction works. Nevertheless, as a conservative approach, the water quality modelling for HKLR and HKBCF will assume a degree of leakage of the aforesaid measures, with an aim of showing that even allowing for conservatism (i.e. leakage of the measures notwithstanding that the SWC project showed no such leakage) the relevant water quality criteria will still be met.

4.2.1.4 Pursuant to the above, the number of substructures being constructed concurrently will be assumed to be limited. The water quality modelling will take the assumed leakage rate and the assumed number of concurrent substructures into account. Details in this regard will be described further in **Section 9** on Water Quality.

4.2.2 Superstructures

4.2.2.1 It is envisaged that the superstructures of the HKLR Viaduct, for accommodating the dual-3 lane (plus a hardshoulder on each bound) carriageway, will be constructed by one of the following methods:

- (a) Precast segmental method, with the bridge deck constructed as precast segments (each a few metres long) which are lifted into position and then stitched & prestressed together — This method was adopted extensively for numerous bridgework projects in Hong Kong in recent years (e.g. SWC, Deep Bay Link, Route 8);
- (b) Precast spans method, with each span (about 100 m or even longer) precast as a mega element and then lifted into position by vessels of mega lifting capacity — This method was adopted in some of the mega bridgework projects worldwide (e.g. the Dong Hai Da Qiao 東海大橋 project in Mainland China);

- (c) In-situ balanced-cantilever method, with the bridge deck constructed as in-situ segments by a travelling formwork (each segment was concreted in-situ and then prestressed onto the preceding segment) — This method was adopted in some of the projects in Hong Kong (e.g. Castle Peak Road Improvement Siu Lam Viaduct, constructed during 2004 to 2006).
- 4.2.2.2 The foregoing methods do not differ significantly in terms of environmental impacts. The selection of method is, rather, driven by consideration on engineering constraints and the individual contractors' available equipment/resources in-hand. For instance, contractors with good ability in arranging vessels of mega lifting capacity may opt for the precast spans method for the section of HKLR from HKSAR boundary to San Shek Wan (SSW) headland, but the restrictive conditions in the Airport Channel do not favour such a method.
- 4.2.2.3 It should be noted that although the precast segmental method does not require mega lifting equipment as that for the precast spans method, the length of spans that the precast segmental method can sustain is usually limited to about 80 m (due to limitation on the capacity of the launching girder for such a method). To avoid stretching to the limit, it is assumed that the length of spans for precast segmental method should be limited to 75 m. This was also the spans-length adopted for the typical spans of the SWC approach viaduct.
- 4.2.2.4 For the section of HKLR Viaduct from HKSAR boundary to SSW headland, the water quality modelling will assume a spans-length less than 75 m. (*Note: Even if typical spans are 75 m, the overall average span will be less than 75 m, as spans adjacent to expansion joints will be shorter for structural reason.*) The Contractor will of course be allowed to adopt the precast spans method with spans well above 75 m, but that will only be more favourable in terms of water quality.
- 4.2.2.5 The HKLR Viaduct does have a number of spans that must be significantly longer than 75 m mainly for navigation reason. These will be constructed either by the precast spans method (where the Contractor has got mega vessels available and where conditions allow the use of such vessels), or by the in-situ balanced-cantilever method (such as those long spans in the Airport Channel which may be too restrictive for precast spans method anyway).
- 4.2.2.6 The span-lengths assumed in the water quality modelling will be set as the lower-bound for span-lengths in the detailed design of those portions of the HKLR Viaduct in waters.

4.3 HKLR Tunnel cum At-grade Road (from Airport Island to HKBCF)

- 4.3.1 Tunnel
- 4.3.1.1 The tunnel through Scenic Hill will be constructed as a bored-tunnel, as this is the only tunnel-form viable for tunnelling through a hilly terrain.
- 4.3.1.2 This section of tunnel will be partly through rock. On most occasions, bored-tunnelling through rock will use blasting so as to expedite excavation. However, in view of the proximity of the Ngong Ping 360 Cable-Car facility nearby, blasting will be prohibited, which means tunnelling through Scenic Hill will be limited to mechanical excavation. Though this will be more time-consuming, the length involved is only 0.5 km, hence adopting a more time-consuming method for tunnel excavation will not affect HKLR's programme critically.
- 4.3.1.3 The HKLR tunnel will continue beyond Scenic Hill onto the reclamation in **Section 4.3.2** below. It will be constructed by a combination of the following methods:

- (a) Cut-and-Cover method, involving trench-excavation (i.e. open-cut) followed by in-situ construction of the tunnel structure in the trench, and then backfilling around the tunnel structure;
 - (b) Trenchless method (for the portion where open-cut is impossible, notably the portion of HKLR tunnel underpassing the Airport Railway), involving bored-tunnelling with special stabilisation measures such as pipe-piling and jet-grouting to support the tunnel-bore during construction.
- 4.3.1.4 In view of the proximity of the Airport Road and the Airport Railway, blasting will be prohibited too for the section of tunnel from Scenic Hill to the reclamation. Such a restriction will not bear upon HKLR's programme critically, as this section of tunnel will be mainly in soft ground anyway.
- 4.3.2 Reclamation & At-Grade Road
- 4.3.2.1 As HKLR tunnel will be at a deep level at the chainages underpassing the Airport Railway, it will need to be embodied by a piece of reclamation at its eastern-most portion (which will be in the waters adjacent to the south-eastern side of Airport Island, hence the need for reclamation to protect the tunnel from vessels collision). The eastern end of the tunnel will daylight as a portal in the reclamation, as shown on [Figure 4.2](#). It is anticipated that the section of tunnel in the reclamation, including the portal, will be constructed by the Cut-and-Cover method.
- 4.3.2.2 The reclamation will involve the following key features:
- (a) Seawall along the periphery of the reclamation, which will involve dredging for removal of marine-deposit along the base of the seawall, followed by rockfilling and then rock-armouring;
 - (b) Reclamation filling between the seawall and the existing Airport Island, which will involve the consolidation measures noted in **Section 4.1** above. *[Note: Even though the consolidation measures will involve a time-consuming surcharge period, it should still be able to be accommodated within HKLR's construction programme. Hence, this portion of reclamation for HKLR will adopt the non-dredge method i.e. with consolidation measures, in lieu of full-dredging.]*
 - (c) In view of the limited capacity of contaminated mud pit in Hong Kong, the dredged Mf material (i.e contaminated mud requiring Type 2 – Confined Marine Disposal) from HKLR reclamation will be deposited back to the pit within HKLR. Additional dredging of uncontaminated mud is required to form the pit to receive Mf material. The detailed arrangement and mitigation measures are given in **Section 9.10.4**.
- 4.3.2.3 As the HKBCF will also involve the same type of seawall as above as well as non-dredge reclamation, reference should be made to **Section 4.4** below for further descriptions on the foregoing key features.
- 4.3.2.4 After daylighting from the tunnel-portal in the reclamation area, the HKLR will continue mainly as an at-grade road on the eastern side of the Airport Island. It will rise up and take the form of an elevated bridge locally, at the connection point with the HKBCF, in order to overpass the road connecting TMCLKL and the Airport.

4.4 HKBCF Reclamation Works

4.4.1 Main Types of Seawall/Reclamation

4.4.1.1 In general, the types of seawall/reclamation considered for HKBCF are mainly as that shown on [Figure 4.5](#).

4.4.1.2 As the HKBCF reclamation area is accessible abundantly by land transport, there is no substantial need for berthing of vessels. Accordingly, the seawall along HKBCF's periphery will substantially be sloping seawall with rock-armour surface, as this type of seawall is generally more cost-effective and performs well in wave-absorption, whereas the vertical type of seawall is usually adopted only if there is a need for berthing of vessels. *(At detailed design stage, the need for berthing may arise, but it is not anticipated that the extent involved will be significant, i.e. at most this will lead to some local short sections of vertical seawalls.)*

4.4.1.3 As the seawall serves to retain the reclamation fill behind it, the base of a seawall requires a much higher engineering capacity than that of the reclamation fill, in order to sustain pressure on the seawall from the material behind. Accordingly, the majority of seawalls worldwide adopt full-dredging for total removal of marine deposit along the base, with the trench thus dredged filled with firm materials (e.g. sandfill or rockfill) serving as seawall foundation. This is also the common practice for the design of seawalls in Hong Kong.

4.4.1.4 In the preliminary design of the seawalls for HKBCF, consideration was given to deviate from the above to adopt non-dredge types of foundation. However, as will be explained below, the applicability of these methods is limited. Hence, it is assumed in both the preliminary design and the EIA for HKBCF that the seawalls will adopt fully-dredged foundations.

4.4.1.5 As regards the reclamation behind the seawall, the scope for application of non-dredged method (i.e. with measures to accelerate consolidation of those marine sediment layers that are not dredged), in lieu of full dredging, is much more realistic than in the case of the seawalls. Typically the consolidation measures involve the laying of geotextile & sandblanket onto the seabed surface, together with the installation of band-drains and surcharging.

4.4.1.6 The key issue to be addressed in deciding whether HKBCF should adopt non-dredge reclamation (with consolidation measures) or fully-dredged reclamation should be adopted will depend on whether its construction programme can accommodate the time-consuming surcharge period entailed by non-dredged reclamation. Another key issue is to consider the environmental advantages of non-dredge reclamation as it obviates dredging and reduces reclamation filling. Consideration in this regard will be presented in **Section 4.4.3** below.

4.4.1.7 In view of the limited capacity of contaminated mud pit in Hong Kong, the dredged Mf material (i.e. contaminated mud requiring Type 2 – Confined Marine Disposal) from HKBCF reclamation will be deposited back to the pits within HKBCF. Additional dredging of uncontaminated mud is required to form the pit to receive Mf material. The detailed arrangement and mitigation measures are given in **Section 9.10.4**

4.4.2 Non-dredge types of Seawall Foundations considered

4.4.2.1 The following non-dredge types of seawall foundations have been considered for HKBCF:

- Stone-Columns;
- Deep Cement Mixing (DCM);
- Sand Compaction Piles (SCP).

4.4.2.2 The viability/applicability of these methods to the seawalls of HKBCF are outlined below:

Method	Viability/Applicability or Limitations
Stone Columns	<p>(a) Should this method be adopted, the depth of undredged marine-deposit left below the seawall would have been 14m to 26m. This means very long stone-columns will be required to strengthen the marine deposit. Such a long length will aggravate the stone-columns' tendency to buckling, hence reducing their engineering capacity.</p> <p>(b) Stone-Columns' track-record for strengthening thick marine deposit below seawalls is much less than that of DCM and SCP, and is of course far less than that of the fully-dredged method.</p> <p>(c) In terms of cost-effectiveness, stone-columns are unfavourable too, of the order of 2 times more costly than the SCP method.</p> <p>In view of the above, the stone-columns method is considered to be not viable.</p>
DCM	<p>(a) The application of DCM will involve various concerns, including the temperature-rise of cement-hydration, the durability of cement in the seabed, and the risk of eruption from the seabed during injection of the cementitious material. The latest factor is of particular concern, as the erupted materials will contain cement and associated chemicals, causing serious impact on water-quality and marine-ecology.</p> <p>(b) A full-scale trial will need to be carried out to establish the viability of DCM. This cannot be accommodated in the construction programme of HKBCF.</p> <p>(c) In terms of cost-effective, DCM is unfavourable too, of the order of 2 to 3 times more costly than the SCP method.</p> <p>In view of the above, the DCM method is considered to be not viable. <i>(It should also be noted that in the current Busan New Port project, one of the largest marine works projects in the world, DCM was adopted in the early years of the project for seawall foundations, but in recent years SCP has become the predominantly adopted method in that project.)</i></p>
SCP	<p>(a) In a site visit to the Busan New Port project in September 2008, it was observed that SCP was applied extensively to serve as seawall foundations, obviating the need for dredging. As observed then, there was no noticeable water pollution during the application of SCP, so much so that the engineers in-charge of the Busan New Port project considered it unnecessary to install silt-curtains around the SCP site and unnecessary to carry out any water quality monitoring. Nevertheless, after discussions with EPD, it is considered that a full-scale trial may be required for SCP too, in which case the same disadvantage as (b) above for DCM will arise.</p>

Method	Viability/Applicability or Limitations
	<p>(b) The SCP method is a relatively new technique; for instance, in the early years of the Busan New Port project, the SCP method was not yet established, hence the adoption of the DCM method then. Though the SCP method has become increasingly common in large marine works projects in Japan and South Korea, the number of SCP plant available is still limited. It is understood that mobilisation of such a plant to Hong Kong will take about a year.</p> <p>(c) In terms of technical details, there are two more limitations on the application of SCP:</p> <ul style="list-style-type: none"> • The seabed will upheave when applied with SCP; in the case of HKBCF, the application of SCP in areas where existing seabed is shallower than -6 mPD will not be OK as the upheaved seabed will affect accessibility of vessels. • The SCP plant will need a headroom up to +42 mPD. Allowing for safety margin, the above means that SCP is applicable only for those areas where the Airport Height Restriction (AHR) contour is +45 mPD or above.

4.4.2.3 In view of the above, it is considered that Stone-Columns and DCM are not viable, whereas SCP may be worth considering for those portions of the HKBCF seawalls where seabed is deeper than -6 mPD and AHR is +45 mPD or above, PROVIDED THAT the following issues can be overcome:

- (a) That the Contractor can provide further data to obviate the need for a trial, such as the arrangement of water quality monitoring under a relevant overseas project;
- (b) That the actual mobilisation time of the SCP plant will enable the method to be applicable to a significant proportion of HKBCF's seawalls.

As the foregoing aspects do involve uncertainty that cannot be eradicated at this stage, the EIA for HKBCF will assume full-dredging for all the seawalls. This will be on the conservative side, as SCP (if adopted for any portion of the seawalls) should only constitute an improvement as it serves to reduce the amount of dredging, hence reducing the amount of seawall-filling too.

4.4.3 Dredge/Non-Dredge for Reclamation and Overall Construction Sequence of Reclamation Works

4.4.3.1 In the preliminary design and the planning for the HKBCF Reclamation Works, the following aspects are considered together as they are interrelated/interdependent with each other:

- (a) Whether the reclamation behind the seawall should adopt the non-dredge option (with consolidation measures as noted in **Section 4.4.1** above) or the fully-dredged option;
- (b) The overall construction sequence of the reclamation works (including seawalls, dredging if any, consolidation measures, reclamation filling), for ensuring that relevant parts of HKBCF's reclamation areas will be available

early enough for the Land Works, which are targeted to be completed in two phases by 2015/2016.

- 4.4.3.2 Whereas for reasons explained above full-dredging is assumed for all the seawalls of HKBCF, the reclamation behind the seawalls will adopt the non-dredge option (with consolidation measures) as far as applicable, i.e. full-dredging will be adopted only if it is essentially needed. This serves to reduce the amount of dredging hence reducing the amount of reclamation filling.
- 4.4.3.3 Another important principle is to plan the sequence of reclamation works in such a way that seawalls construction will precede reclamation filling, so that the former will afford a degree of containment on the latter. This will serve to reduce water quality impact during reclamation filling.
- 4.4.3.4 Taking account of the relevant factors involved, two options are formulated as regards the construction sequence of the Reclamation Works for HKBCF, as shown on **Figures 4.6 and 4.7**. These are referred to as Sequence A and Sequence B; a comparison of the key aspects of these two Sequences is tabulated below:

	Sequence A	Sequence B
Key Features	<ul style="list-style-type: none"> • Adopts a series of interim/temporary seawalls around the proposed locations of the Passengers Clearance Building (PCB) and the Government buildings — With these interim seawalls, the reclamation extent needed in order to start construction of the PCB and Government buildings is minimised. This is advantageous from programming point of view, as the construction time of PCB and Government buildings would be much longer than other Land Works and thus these two activities are more critical. • Owing again to the acute criticality of the construction of the PCB and Government buildings, full-dredging is adopted locally for that portion of reclamation at/around the PCB and Government buildings. 	<ul style="list-style-type: none"> • No interim seawalls: As a result, the reclamation extent in order to start construction of the PCB and Government buildings becomes larger than that in the case of Sequence A. • Full-dredging is adopted for the seawalls only, i.e. the entire reclamation behind the seawalls will adopt the non-dredge option (with consolidation measures).
Programme	<ul style="list-style-type: none"> • Sequence A will enable the 1st phase of HKBCF to be completed by 2014. 	<ul style="list-style-type: none"> • Sequence B will involve more extensive surcharging which is time consuming, but the target date of 2015 for completion of the 1st phase of HKBCF will just be met.

	Sequence A	Sequence B
Environmental Performance	<ul style="list-style-type: none"> • Involves more dredging and hence more reclamation filling; • Hence will result in larger water quality impacts as well as ecological impacts both on-site and off-site such as those regarding deposition / disposal of dredged materials. 	<ul style="list-style-type: none"> • Involves less dredging and hence less reclamation filling; • Hence will result in less water quality impacts as well as ecological impacts both on-site and off-site such as those regarding deposition / disposal of dredged materials.

4.4.3.5 In view of the above, Sequence B should be adopted as it is environmentally more advantageous and as it can still meet the vital programming target. Nevertheless, for such a complicated project as HKBCF, there is a possibility that the need to change to Sequence A may occur; for instance, in case of unforeseen delay in the earlier tasks, the change from Sequence B to Sequence A will enable the project to gain back time to compensate for earlier delay. For this reason, though the planning of HKBCF should be based on Sequence B, the assessment of water quality impacts will be based on Sequence A for conservatism.

4.5 HKBCF Roadworks

4.5.1 The majority of roadworks for HKBCF will be in the form of at-grade roads in the reclamation area. It is anticipated that these will mainly be in the form of bituminous surfacing layers laid on subbase materials.

4.5.2 The HKBCF will also involve various elevated bridge structures for the following:

- (a) HKLR’s connection to the HKBCF, in order to overpass the road connecting TMCLKL to the Airport;
- (b) Various ramps connecting HKBCF to the TMCLKL (for connecting to both its main tunnel across Urmston Road and its Southern Connection onto North Lantau Highway);
- (c) HKBCF’s roadlink to the Airport, which will be constructed partly within the HKLR reclamation in **Section 4.3.2** and partly on the existing Airport Island.

4.5.3 These elevated bridgework will take the form of prestressed concrete box-girders for the bridge deck, founded on reinforced concrete substructures (columns, pilecaps and bored-piles). As they are constructed on land either on HKLR/HKBCF reclamation or on the existing Airport Island, different types of construction (eg. whether the bridge deck will adopt precast construction or in-situ construction) will not differ significantly in terms of environmental impacts.

4.5.4 A special point to note is that one of the legs in the HKBCF-Airport roadlink will take the form of a tunnel, extending from the HKLR reclamation area onto the existing Airport Island. Part of the tunnel will underpass the Airport Railway and the Airport Road. Similar to **Section 4.3.1.3** above, this tunnel will be constructed by a combination of Cut-and-Cover method and Trenchless method.

4.5.5 An overall layout of the HKBCF-related roadworks, as described in **Sections 4.5.1 to 4.5.4** above, is shown on **Figure 4.8**.

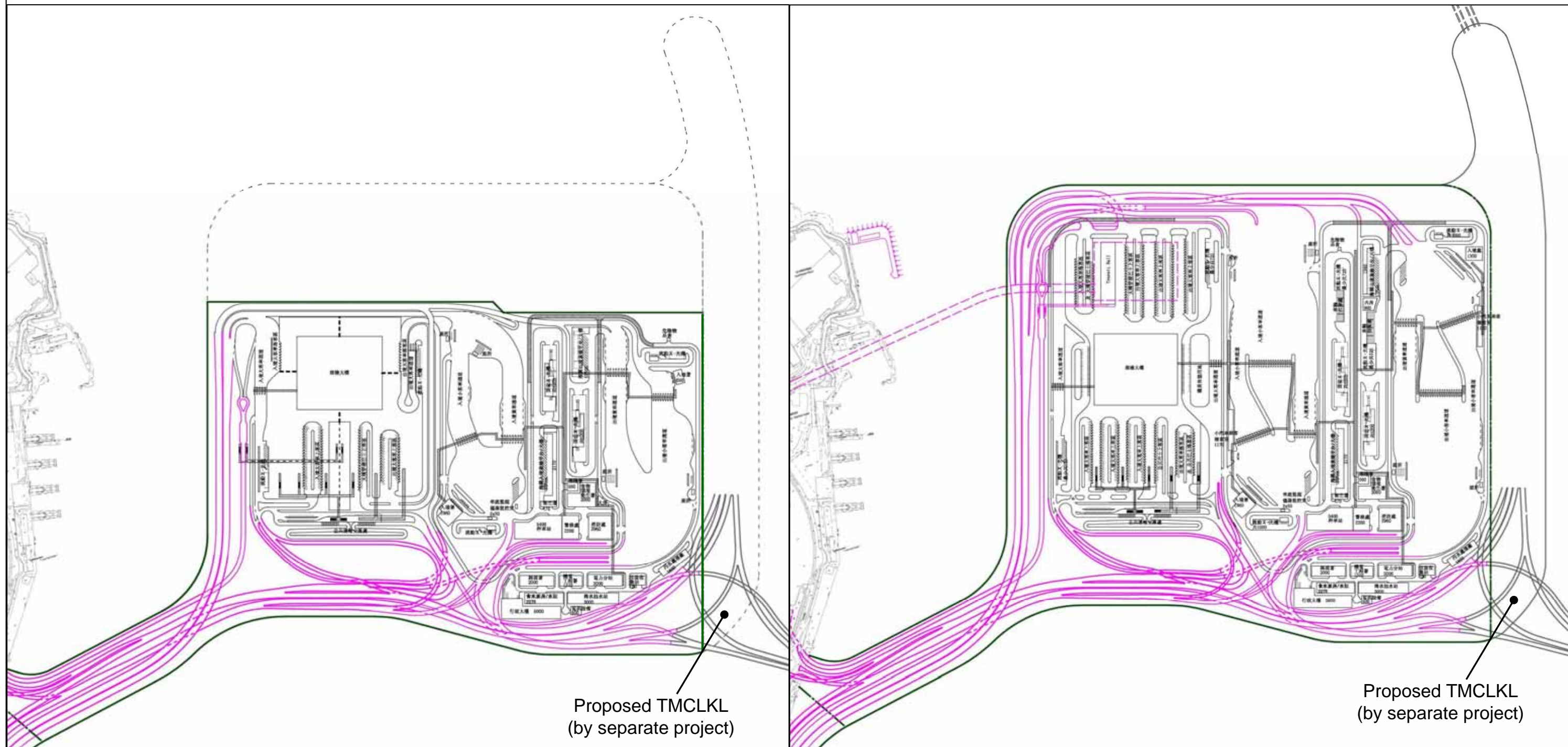
4.6 HKBCF Drainage, Sewerage and Utilities

- 4.6.1 During the construction stage, peripheral temporary surface channels will be constructed to collect surface runoff in the reclamation area for desilting before discharging into the adjacent waters.
- 4.6.2 The temporary drainage system during the construction phase will be formulated by the Contractor to match his method of works and construction programme. The temporary drainage will comply with EPD's Practice Note ProPecc PN 1/94.
- 4.6.3 Appropriate mitigation measures to prevent impacts to water quality are discussed in the section on Water Quality Impact Assessment.
- 4.6.4 Drainage, sewerage and utilities will be installed only after the removal of surcharge for control of settlement. Open cutting of trenches with sufficient width and depth would be used for these culverts / drains and utilities. The trenches will then be backfilled after the culverts / drains and utilities are installed.

4.7 Buildings within HKBCF

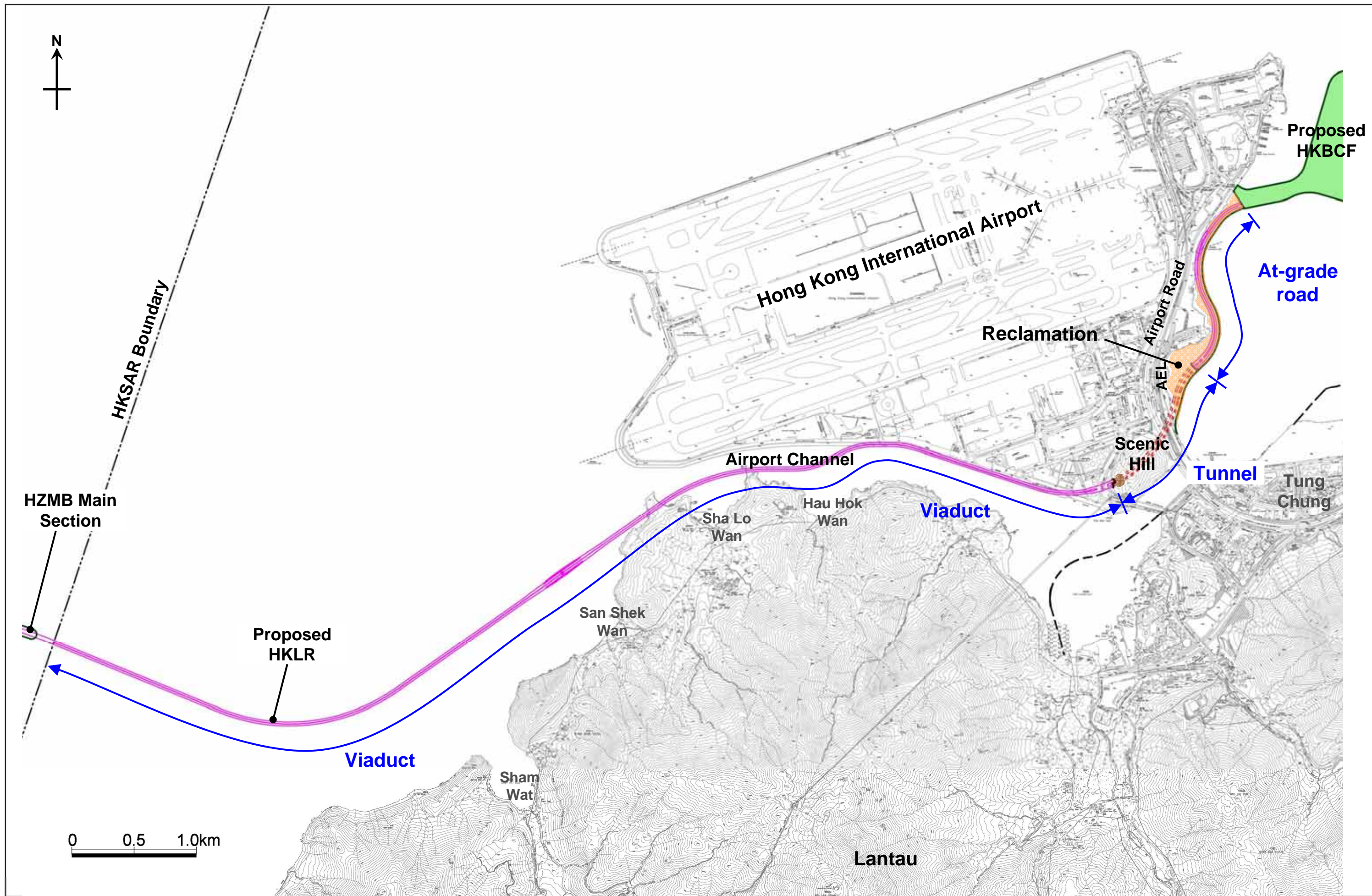
- 4.7.1 The building works to be constructed within the HKBCF reclamation area will include:
- The Passengers Clearance Building (PCB), which is the largest and most prominent building in the HKBCF;
 - Other buildings for accommodating BCF-related facilities and offices for the various Government Departments and personnel involved in the operation/management/maintenance of the HKBCF.
- 4.7.2 An overall layout of these buildings is shown on [Figure 4.9](#).
- 4.7.3 For the PCB, its size will be approximately 160m x 200m on plan; the building will have 4 storeys: G/F for processing inbound HZMB passengers arrived by coaches, 1/F for processing outbound HZMB passengers arrived by coaches, 2/F for operational departments' offices, 3/F for other supporting facilities such as staff canteen, plant rooms and other M&E facilities etc.
- 4.7.4 It is anticipated that the substructure of the PCB will comprise piles with pilecaps, whereas its superstructure will be selected from the following options:
- Conventional in-situ reinforced concrete construction;
 - Precast concrete construction;
 - Steelwork construction much of which will be in the form of prefabricated steelwork elements.
- 4.7.5 The building works on HKBCF reclamation are over 2km from the sensitive receivers (SRs) at Tung Chung. Even for the relatively near SRs on the Airport Island (eg. SkyCity Marriott Hotel), the buffer distance is as much as 400m. The choice of structural forms for the building works should not have significant effect as regards environmental impacts on the SRs.
- 4.7.6 The other buildings, being smaller in terms of construction work content, are likely to adopt the more conventional reinforced concrete structural form. However, as stated above, even if a different form is eventually adopted, it should not have significant effect as regards environmental impacts.

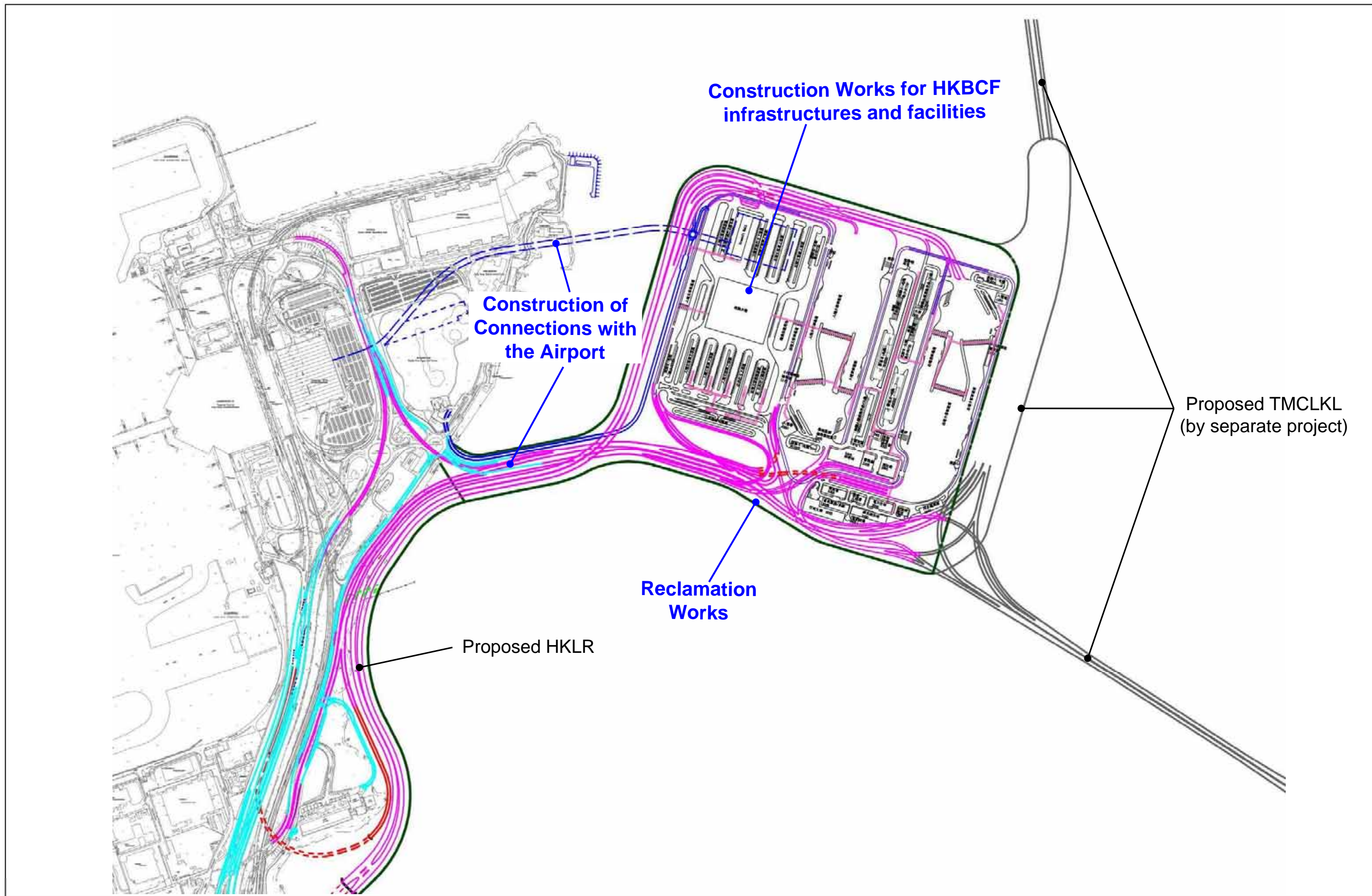
- 4.8 Automated People Mover (APM) between HKBCF & Hong Kong International Airport (HKIA)
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- 4.8.1 A number of alignment options have been considered for the APM between HKBCF and the Airport. Various meetings were held between AAHK, HyD/HZMBHKPMO, FSD, CAD and Arup, the preferred APM alignment is basically an extension of the existing T1-T2 APM line to connect to the HKBCF in tunnel form, passing underneath Airport Expo Boulevard and the existing FSD East Rescue Berth as shown on [Figure 4.10](#).
- 4.8.2 For this APM alignment between HKBCF and the Airport, it is envisaged that the APM tunnel can mainly be divided into four sections with respect to construction methods. An indication of the extent of these sections is shown in [Figure 4.11](#) and [Figure 4.12](#).
- 4.8.3 For the section from the extended HKIA APM line at T2 to the south of AsiaWorld-Expo (AWE), the tunnel section is envisaged to be constructed by cut and cover method in rock in view of the shallow rockhead. Depending on the geological condition of the site, the cut and cover tunnel section will involve rock mining at certain sections where rockhead level is higher than the proposed APM tunnel level, and that will involve temporary lateral support works for tunnel excavation at sections where rockhead level is deep.
- 4.8.4 From the south of AWE to existing FSD Rescue Berth, the APM tunnel will be constructed by tunnel mining method (in rock) underneath the existing Airport Expo Boulevard between AWE and the Marriott Hotel. According to the geotechnical information available, the rock level in this portion is quite high, which is some 10m above the proposed founding level of the APM tunnel. As there are also utilities running along Airport Expo Boulevard which would be affected if cut-and-cover method is used, it is considered that this portion of APM tunnel should be constructed by tunnel mining method.
- 4.8.5 For the section from existing FSD Rescue Berth to HKBCF's western seawall, it is envisaged that the APM tunnel will be constructed by immersed tube method. The immersed tube tunnel units will be constructed at offsite casting facilities, and then towed to the tunnel site for installation.
- 4.8.6 For the section after passing HKBCF's seawall and within HKBCF's main reclamation area, it is envisaged that the APM will take the form of a cut-and-cover tunnel.
- 4.9 Tentative Programme
-
- 4.9.1 The tentative construction programme of HKBCF and HKLRF are shown in [Figure 4.13](#) and [Figure 4.14](#) respectively.
- 4.10 Plant Inventory
-
- 4.10.1 The construction plant anticipated to be required for various stages of the construction of HKLR and HKBCF are given in **Section 6**.
- 4.10.2 The Contractors, when developing their own construction programme and methodology, shall take into account the design, work areas, scheme boundary, mitigation measures etc described in this EIA Report. The need and extent of the mitigation measures shall be updated by the Contractors, subject to approval from the relevant authorities.



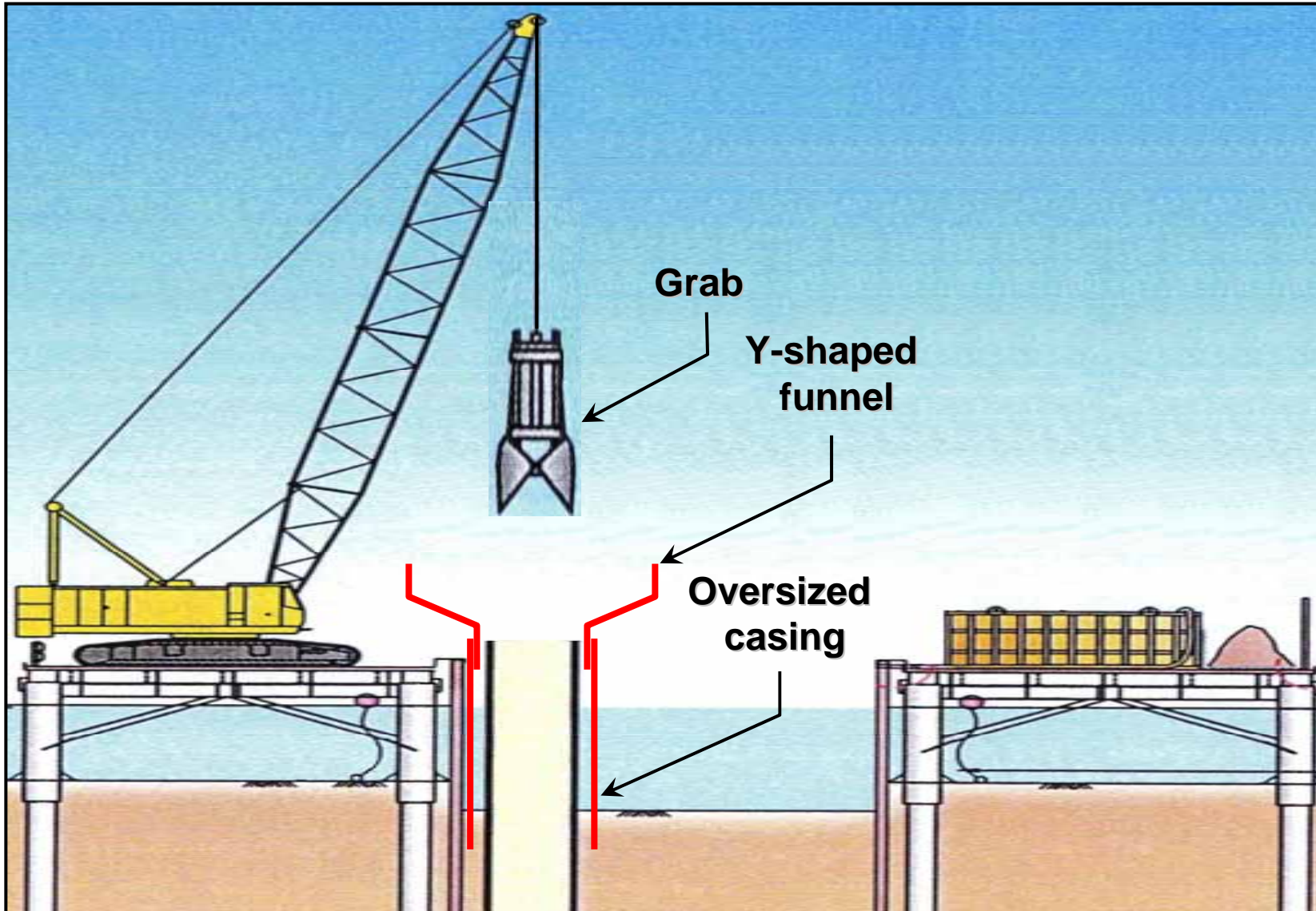
First Phase Reclamation

Full Phase Reclamation

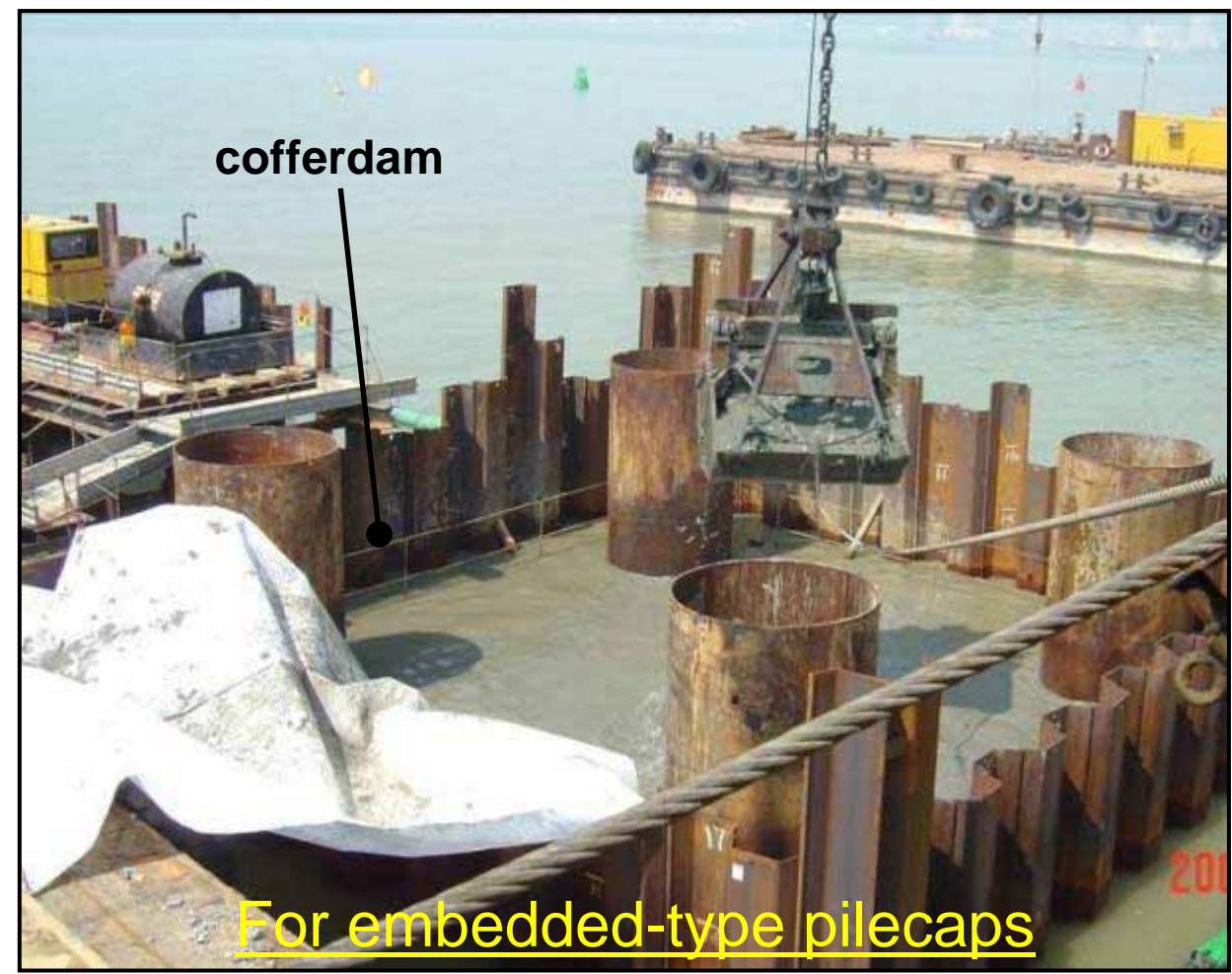




Marine Bored Pile Construction



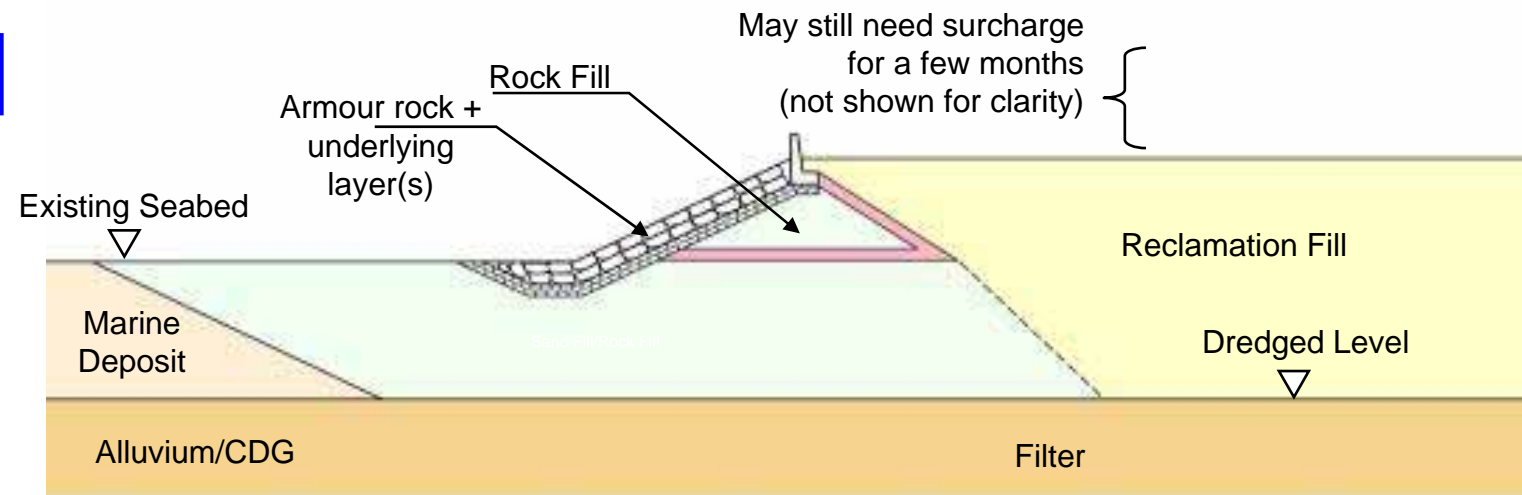
Marine Pilecap Construction



Seawall Method

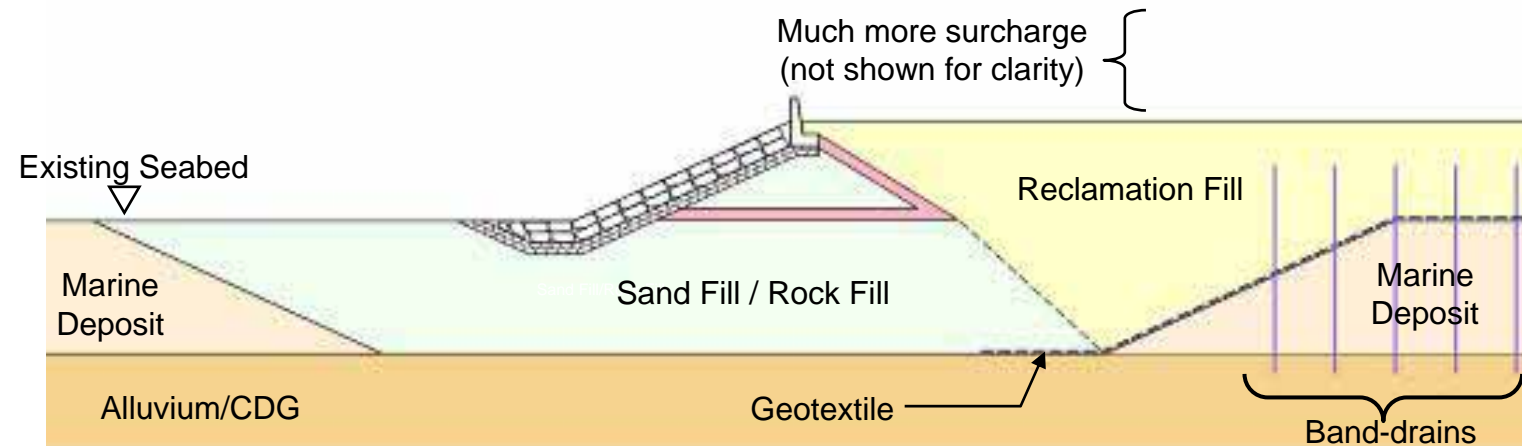
Reclamation Method

Fully-dredged Seawall



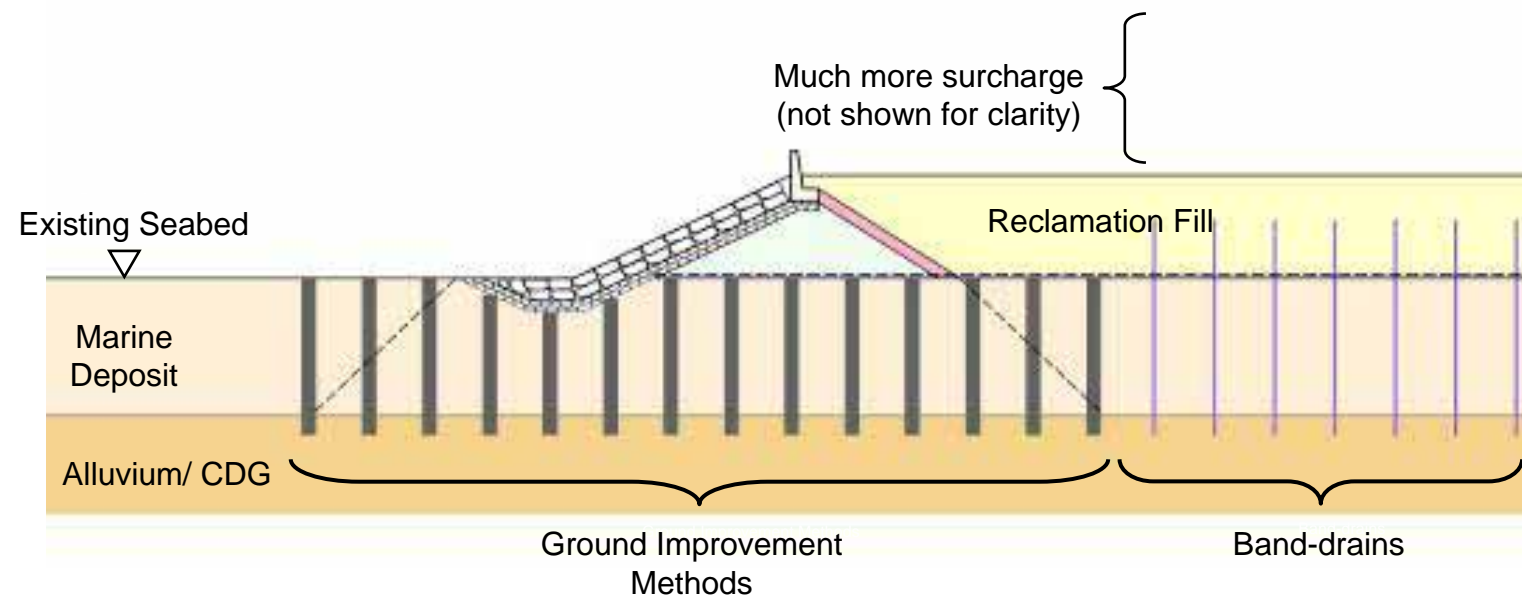
Fully-dredged Reclamation

Fully-dredged Seawall

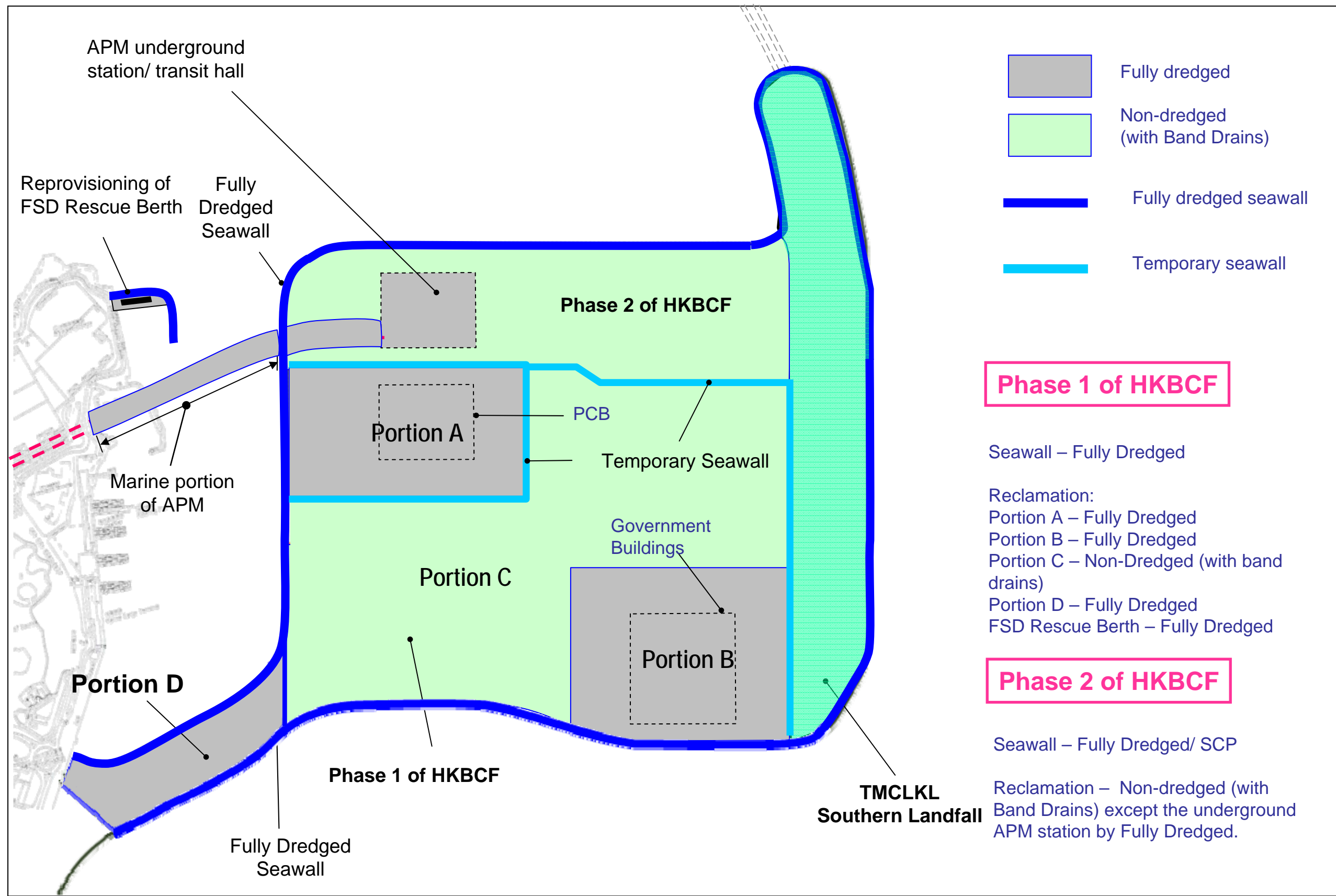


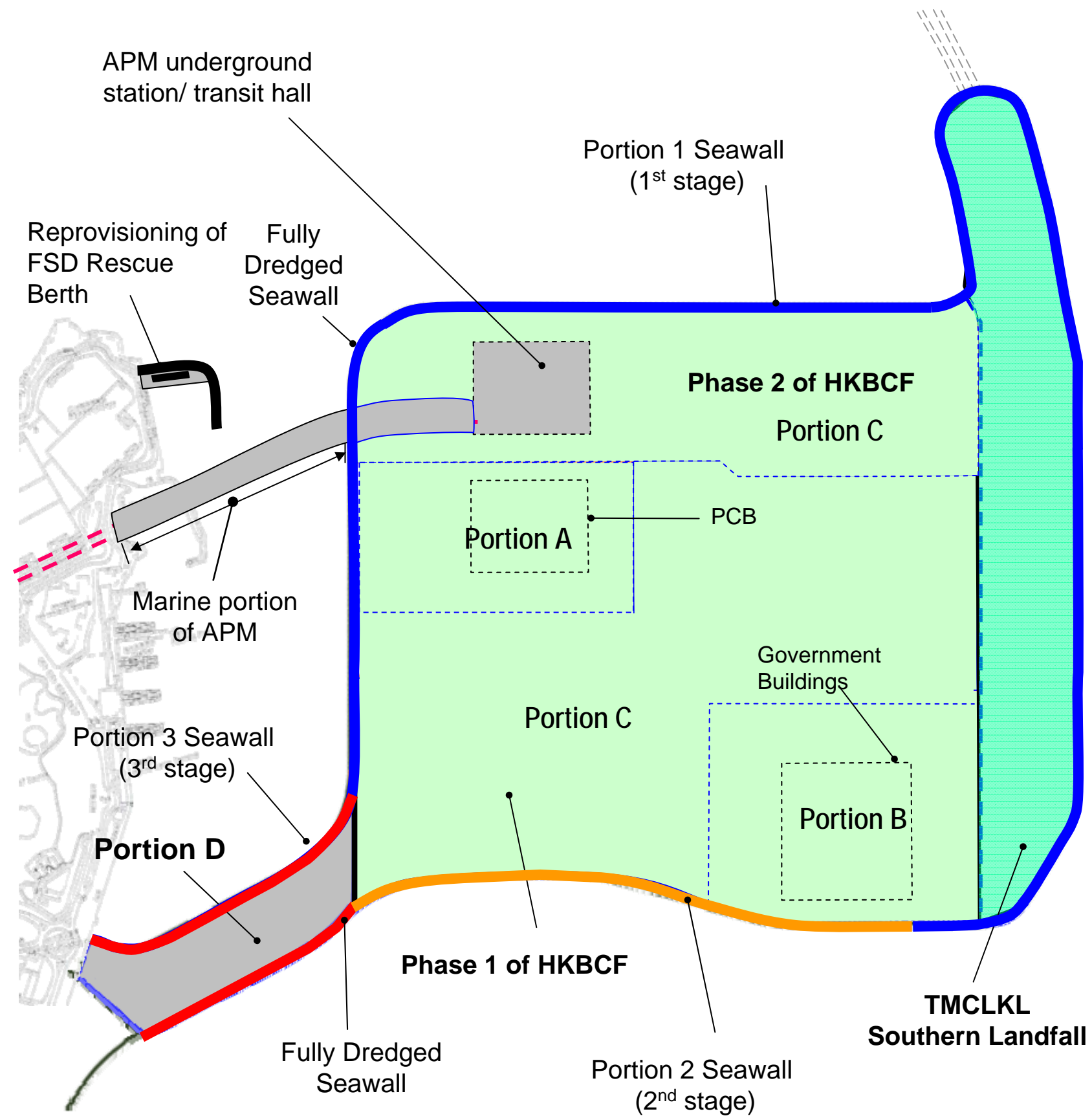
Non-dredged Reclamation (with Band Drains)

Non-dredged Seawall with Ground Improvement Method



Non-dredged Reclamation (with Band Drains)





	Fully dredged	
	Non-dredged (with Band Drains)	
	Portion 1 seawall	} Fully dredged
	Portion 2 seawall	
	Portion 3 seawall	

Phase 1 of HKBCF

Seawall – Fully Dredged

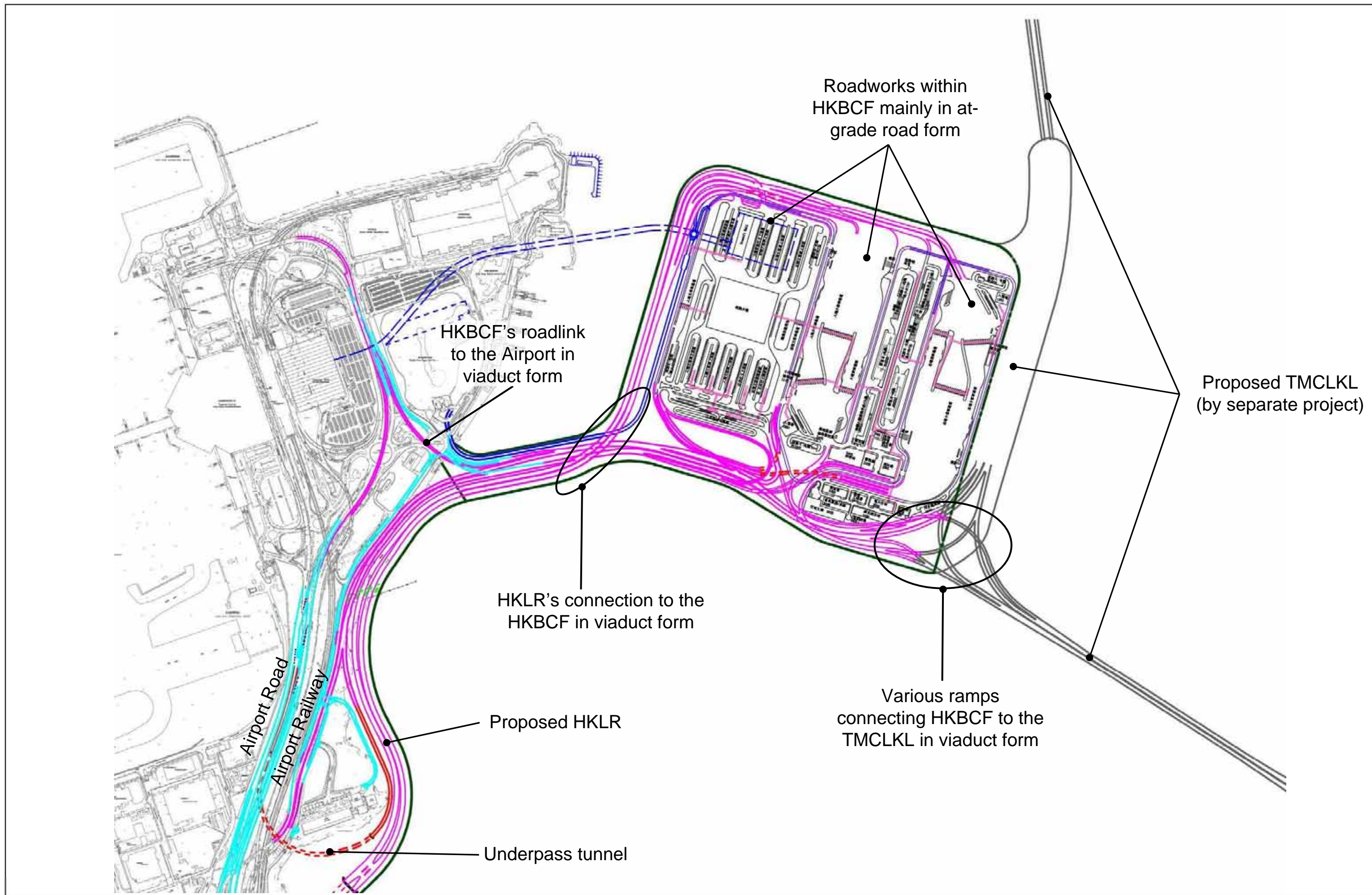
Reclamation:

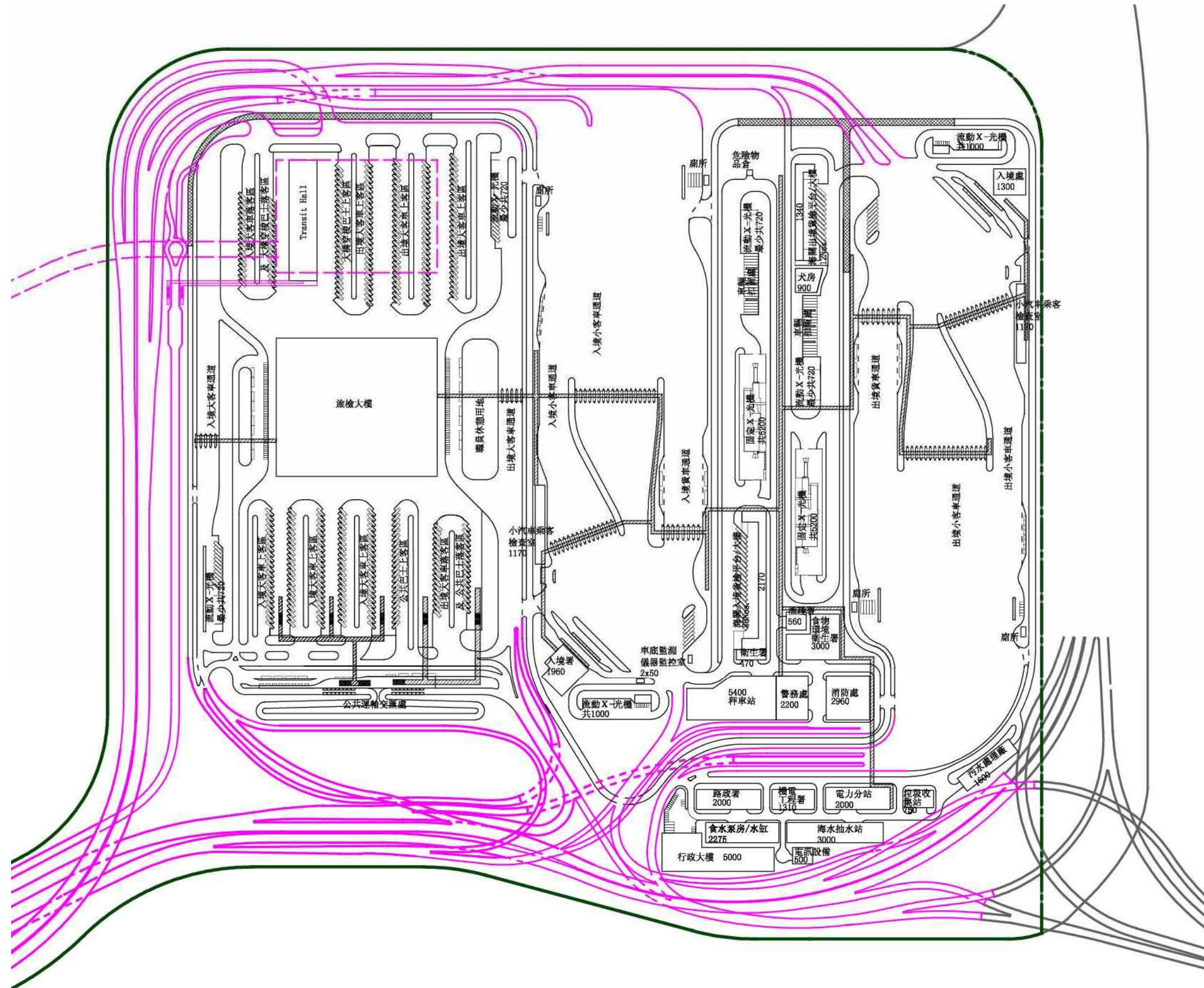
- Portion A – Non-dredged (with band drains)
- Portion B – Non-dredged (with band drains)
- Portion C – Non-dredged (with band drains)
- Portion D – Fully dredged
- FSD Rescue Berth – Fully dredged

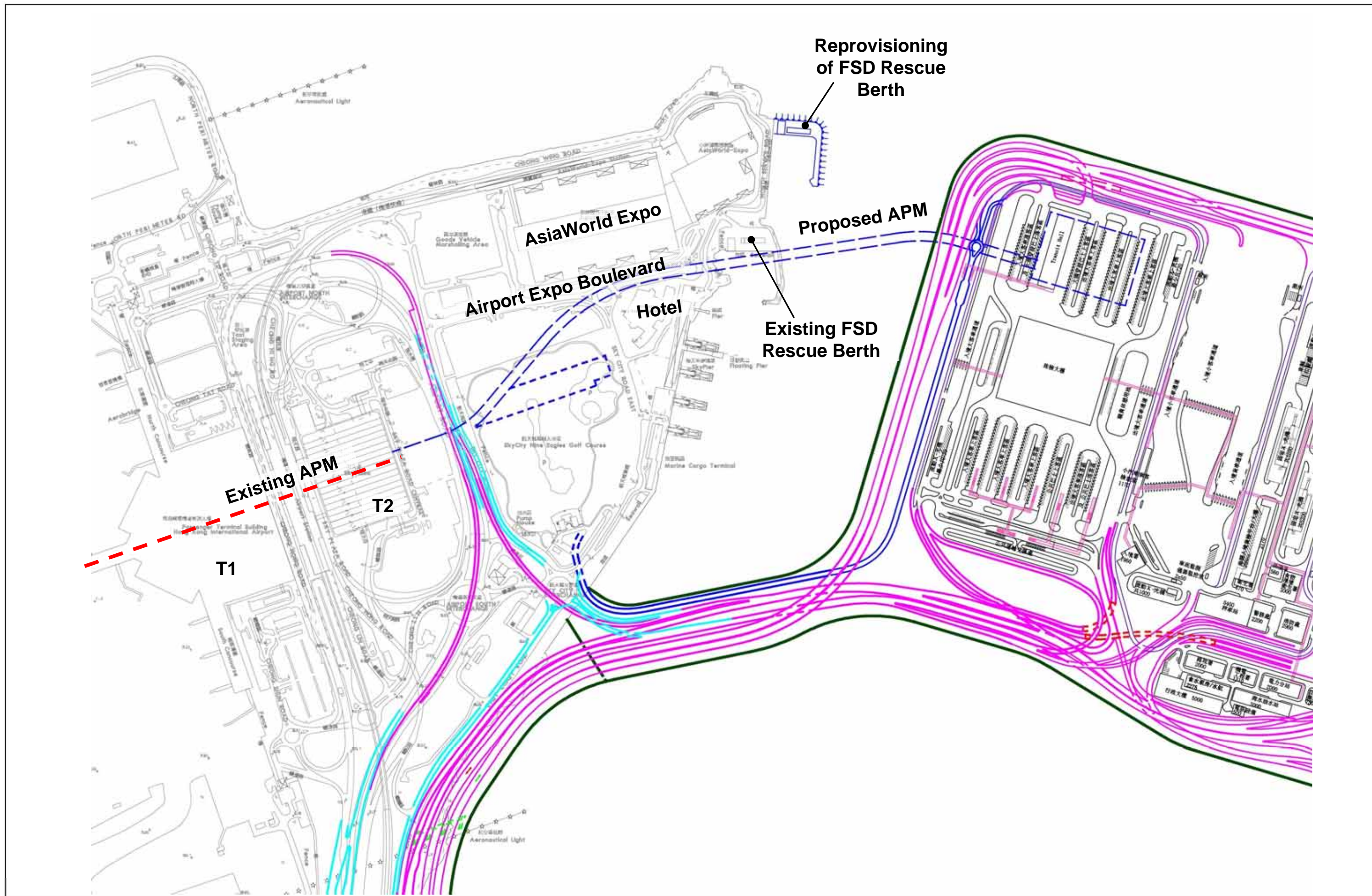
Phase 2 of HKBCF

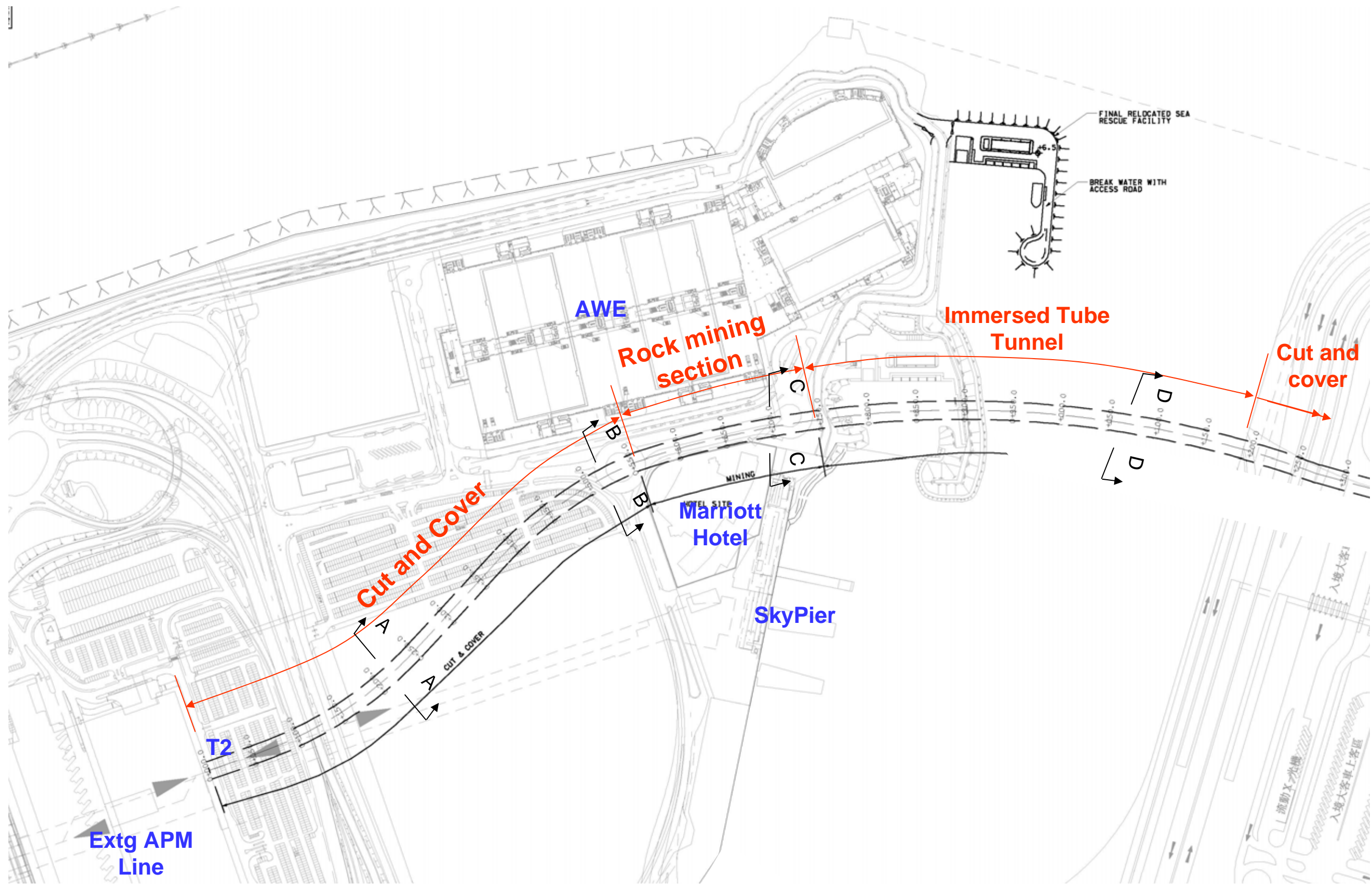
Seawall – Fully dredged

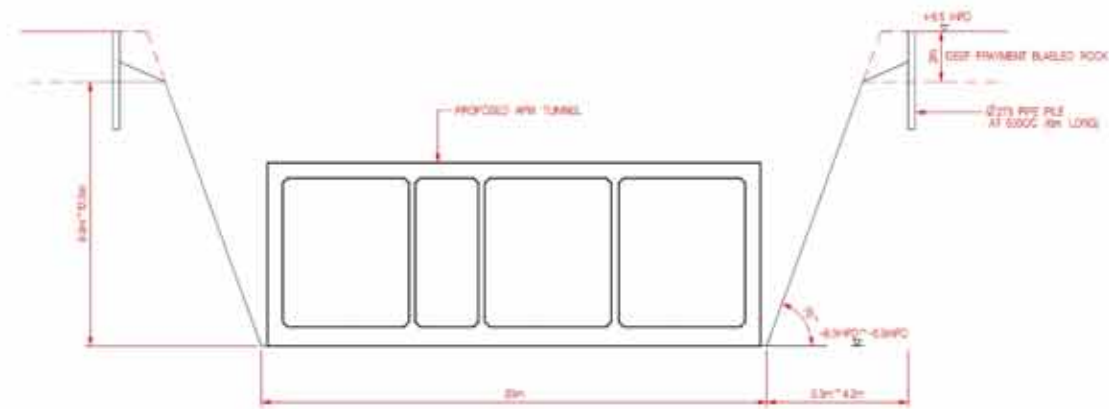
Reclamation – Non-dredged (with band drains) except the areas at underground APM station and tunnel by fully dredged.



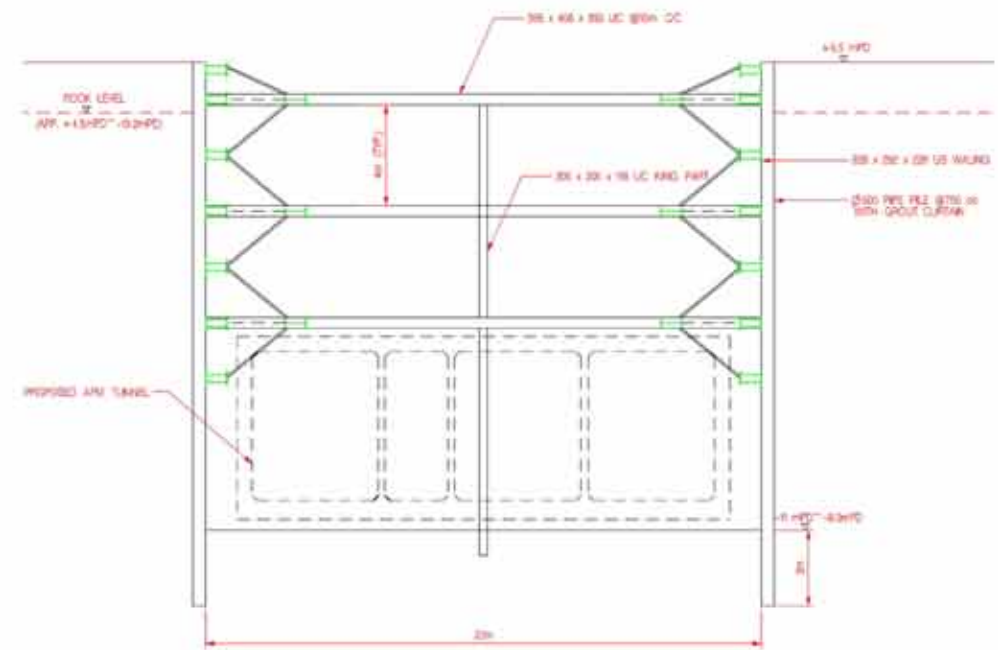




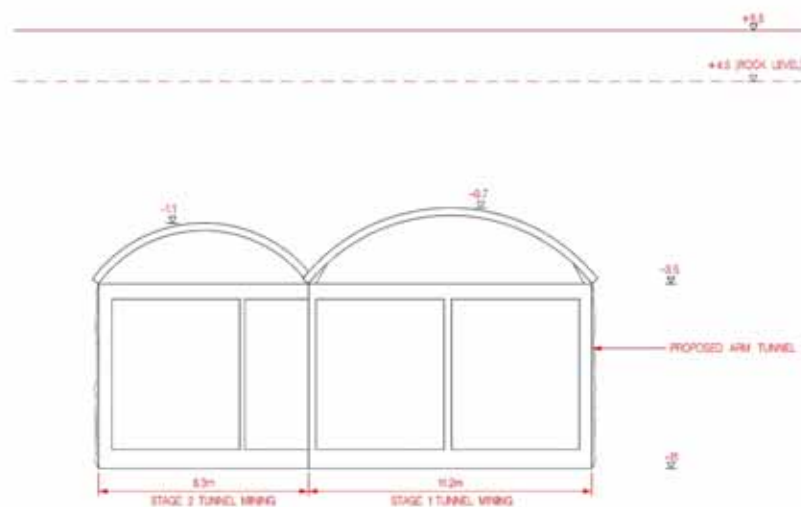




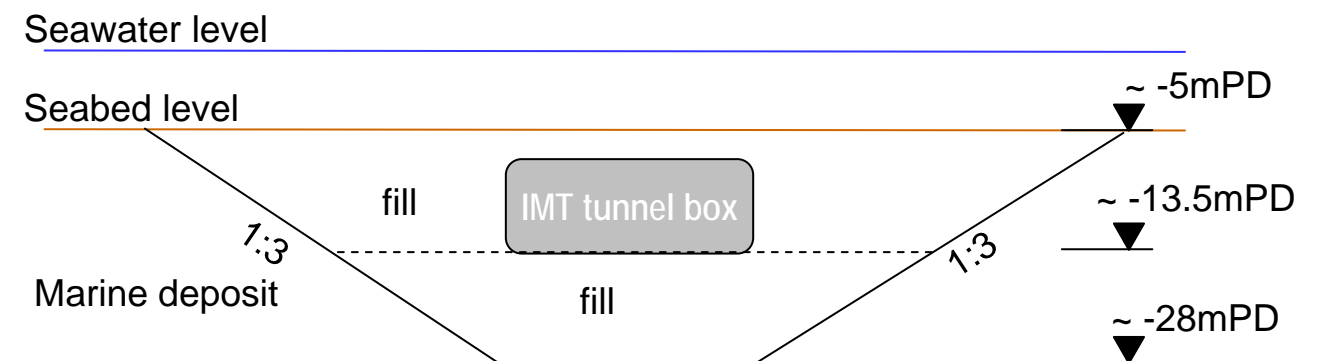
Section A-A
(refer to Fig 4.11)



Section B-B
(refer to Fig 4.11)

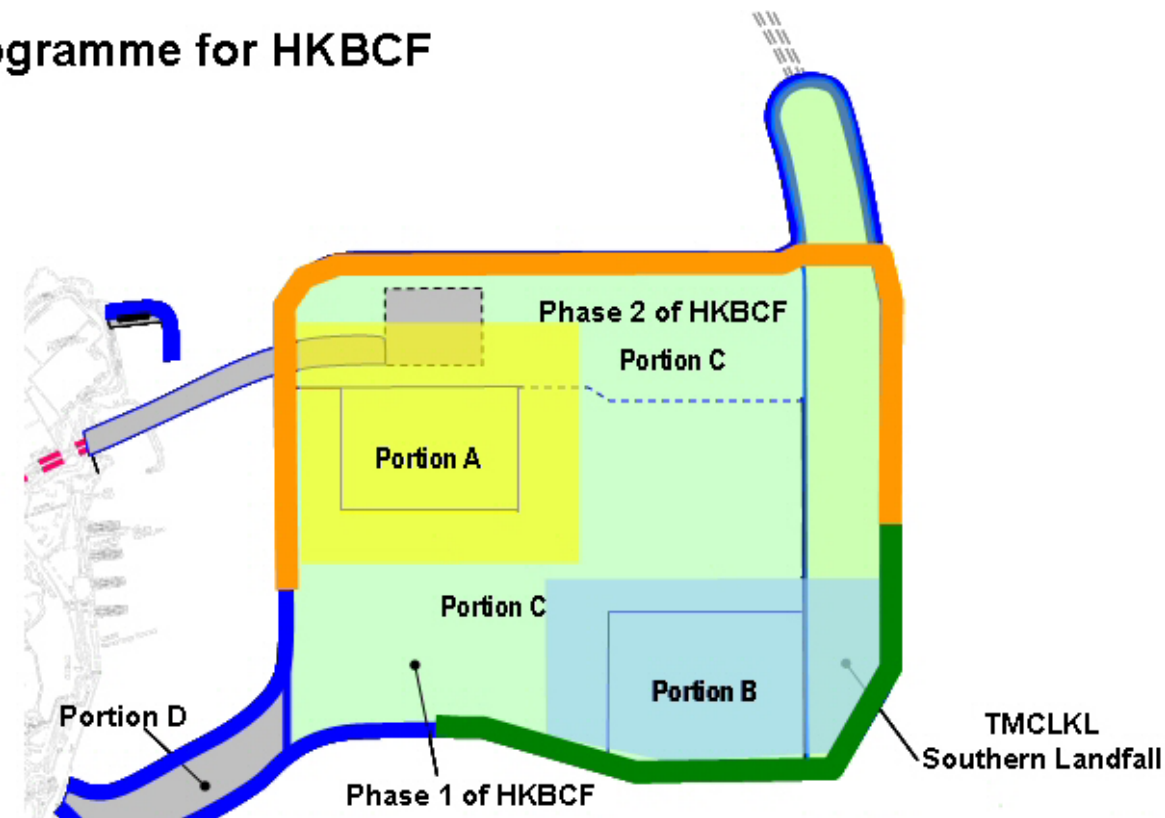


Section C-C
(refer to Fig 4.11)



Section D-D
(refer to Fig 4.11)

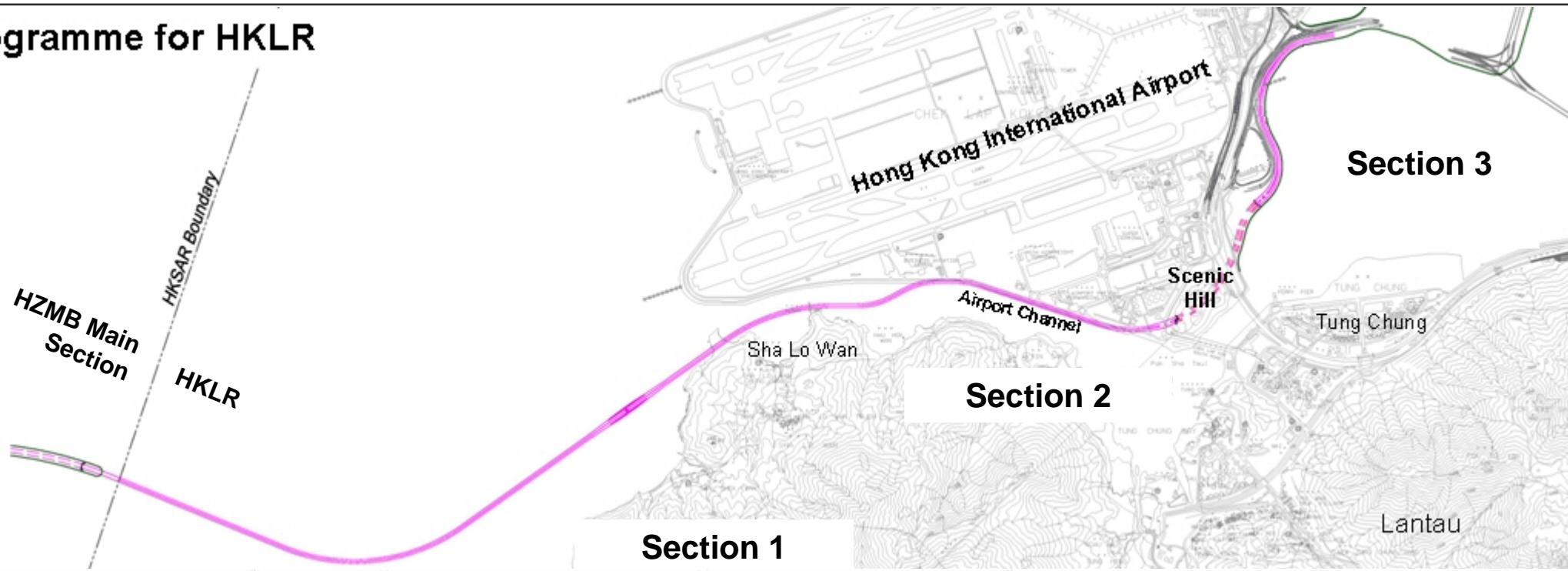
Tentative Programme for HKBCF



Activities		Year 2010			Year 2011			Year 2012			Year 2013			Year 2014			Year 2015			Year 2016			Year 2017											
		A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Seawalls	Mobilisation of plant	[Bar chart showing activity from early 2010 to early 2011]																																
	Seawall dredging	[Bar chart showing activity from early 2010 to mid-2012]																																
	Seawall filling	[Bar chart showing activity from late 2010 to late 2012]																																
Portion A	Geotextile	[Bar chart showing activity from mid-2011 to mid-2012]																																
	Reclamation filling	[Bar chart showing activity from late 2011 to late 2012]																																
	Installation of band drains	[Bar chart showing activity from early 2012 to early 2013]																																
	Surcharging (incl. provision & removal)	[Bar chart showing activity from late 2012 to early 2014]																																
	Infrastructure (PCB and others)	[Bar chart showing activity from late 2012 to late 2015]																																
Portion B	Geotextile	[Bar chart showing activity from late 2011 to early 2012]																																
	Reclamation filling	[Bar chart showing activity from early 2012 to late 2012]																																
	Installation of band drains	[Bar chart showing activity from late 2012 to early 2013]																																
	Surcharging (incl. provision & removal)	[Bar chart showing activity from early 2013 to late 2013]																																
	Infrastructure (Government Bids and others)	[Bar chart showing activity from late 2013 to late 2015]																																
Portion C	Geotextile	[Bar chart showing activity from late 2010 to late 2012]																																
	Reclamation filling	[Bar chart showing activity from early 2011 to late 2013]																																
	Installation of band drains	[Bar chart showing activity from late 2011 to late 2014]																																
	Surcharging (incl. provision & removal)	[Bar chart showing activity from late 2012 to late 2015]																																
	Infrastructure	[Bar chart showing activity from late 2013 to late 2016]																																
Portion D	Dredging for Reclamation	[Bar chart showing activity from late 2011 to early 2012]																																
	Reclamation filling	[Bar chart showing activity from early 2012 to early 2013]																																
	Surcharging (incl. provision & removal)	[Bar chart showing activity from late 2012 to late 2013]																																
	Infrastructure	[Bar chart showing activity from early 2013 to late 2014]																																
FSD berth & APM	Dredging for seawall and reclamation (FSD)	[Bar chart showing activity from early 2010 to early 2011]																																
	Seawall Filling (FSD)	[Bar chart showing activity from late 2010 to early 2011]																																
	Reclamation filling (FSD)	[Bar chart showing activity from early 2011 to late 2011]																																
	Dredging for APM station and tunnel	[Bar chart showing activity from late 2011 to late 2012]																																
	Filling for APM station and tunnel	[Bar chart showing activity from early 2012 to late 2012]																																

Vertical dashed lines indicate key milestones: "Phase 1 completion" at the end of 2015 and "Overall Commissioning of HKBCF" at the end of 2016.

Tentative Programme for HKLR



Activities	Year 2010			Year 2011					Year 2012					Year 2013					Year 2014					Year 2015												
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	
Section 1	Design + GI works																																			
	Pile foundation + pile cap																																			
	Superstructure of viaduct																																			
Section 2	Design + GI works																																			
	Pile foundation + pile cap																																			
	Superstructure of viaduct																																			
Section 3	Design + GI works																																			
	Dredging for seawall (Portion 1)																																			
	Filling for seawall (Portion 1)																																			
	Dredging for Reclamation (Portion 1)																																			
	Geotextile (Portion 1)																																			
	Installation of band drains (Portion 1)																																			
	Filling for Reclamation (Sandfill - Portion 1)																																			
	Filling for reclamation (Public fill - Portion 1)																																			
	Surcharge (Fully-dredged area in Portion 1)																																			
	Surcharge (Non-dredged area in Portion 1)																																			
	Dredging for seawall & reclamation (Portions 2 & 3)																																			
	Filling for seawall & reclamation (Portions 2 & 3)																																			
	Filling for reclamation (Public fill - Portions 2 & 3)																																			
	Surcharge (Portions 2 & 3)																																			
	Tunnel construction (land portion)																																			
Tunnel construction (reclamation portion)																																				
Construction of at-grade road																																				